

## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : DAINIPPON PRINTING CO LTD

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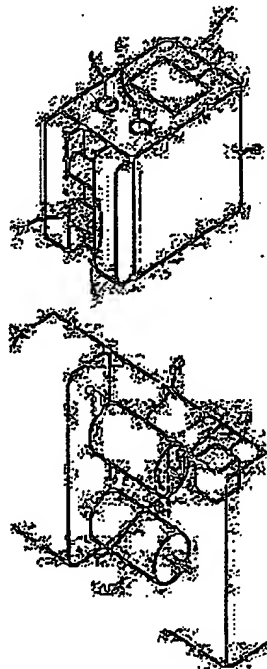
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TAKANO ATSUSHI  
NAKAGAWA YOSHIOKAZU  
OKA MOTOHIRO

## (54) BLOOD ANALYZING DEVICE

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To easily collect the blood by a method independent from suction and easily and quickly analyze the blood by combining a blood collecting mechanism, a puncture member, an electrode, and a display part together, and providing a means for pushing the blood from the skin on the blood collecting mechanism.

**SOLUTION:** When the blood is collected from a finger tip in order to measure a substance to be detected in the blood by use of a blood collecting device 1, a main switch 4 is first put on, and the belly part of the finger tip, for example, is pushed onto both rollers 61, 62. A puncture needle shooting switch 5 is put on, and a puncture needle is protruded from the puncture part 7 between both the rollers 61, 62 to injure the skin of the finger tip. A motor 63 is also driven to rotate a shaft 64 and one roller 6, the space with the other roller 62 is narrowed to nip the skin, so that the blood is pushed out. Further, the pushed blood is brought into contact with a blood collecting member to suck the blood into its hollow part, and then brought into contact with an enzyme ink 94 and both electrodes. The substance to be detected in the blood is detected and measured, and displayed on a display part 3.



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CLAIMS

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## [Claim(s)]

[Claim 1] Hemanalysis equipment characterized by having a means by which provide a blood collecting device, a puncture member, an electrode, and a display, and said blood collecting device extrudes blood from the skin.

[Claim 2] Hemanalysis equipment according to claim 1 characterized by said puncture member and electrode being a cartridge-type.

[Claim 3] Hemanalysis equipment according to claim 1 or 2 characterized by installing said electrode in the location which contacts the blood extruded from the skin in the condition that the body was equipped with hemanalysis equipment.

[Claim 4] Hemanalysis equipment according to claim 2 or 3 which the base of a cartridge has tabular, and the puncture member is prepared in one side possible [ sliding ], and is characterized by arranging the electrode in an another side side.

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates to the hemanalysis equipment which possesses all of a blood collecting device, a puncture member, an electrode, and a display especially about the hemanalysis equipment which can analyze the detected matter contained in blood, such as the blood sugar level.

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PRIOR ART

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[Description of the Prior Art] Conventionally, when the blood sugar level etc. was measured, it was carrying out by making the blood drop adhere to the electrode with which attached the blemish to the fingertip using the reusable puncture instrument (Lancet), pressed out the blood drop from there, picked out from the wrapping material, and the sensor was equipped. However, when the reusable puncture instrument and the sensor have dissociated in this way, there are many processes which are required in performing a series of actuation.

[0003] Then, the blood collecting machine (refer to JP,5-95937,A and JP,5-95938,A) with which the blood collecting machine (refer to JP,5-111476,A, JP,6-311980,A, JP,6-327655,A, and JP,7-51251,A) with which the medical-application system (refer to JP,61-286738,A) by which the reusable puncture needle, the capillary tube, and the sensor were united, a reusable puncture needle, a suction implement, and \*\*\*\*\* were united and a reusable puncture needle, a suction implement, \*\*\*\*\*, and a sensor were united was proposed.

[0004] However, the blood collecting approach in these instruments It is what is depended on the method with which all are decompressed by the syringe, a syringe, etc. and attract blood. unless it sticks the base of a cylinder on the skin, it cannot decompress, but when the cylinder below phi1.5 mm is used, blood plugs up a hole with the former, there is a fault of bleeding stopping, and the structure of a syringe is complicated in the latter -- etc. -- there was a fault.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the convenient hemanalysis equipment which has the device it collecting blood by the approach by suction, and possesses a puncture member, an electrode, and a display.

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MEANS

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[Means for Solving the Problem] By adopting the blood collecting device in which this invention person etc. has the means which extrudes blood from the skin in view of the above-mentioned technical problem as a result of wholeheartedly research, even if not based on the suction approach, it could collect blood easily, and a header and this invention were completed for the ability of blood to be analyzed that it is simple and quickly.

[0007] That is, this invention possesses a blood collecting device, a puncture member, an electrode, and a display, and is hemanalysis equipment with which said blood collecting device is characterized by having the means which extrudes blood from the skin. Moreover, this invention is the above-mentioned hemanalysis equipment characterized by the puncture member and the electrode being a cartridge-type.

[0008] Furthermore, this invention is the above-mentioned hemanalysis equipment characterized by installing said electrode in the location in contact with the blood extruded from the skin in the condition that the body was equipped with hemanalysis equipment. The base of a cartridge has tabular, the puncture member is prepared in one side possible [ sliding ], and this invention is the above-mentioned hemanalysis equipment characterized by arranging the electrode in an another side side further again.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the hemanalysis equipment which possesses all of a blood collecting device, a puncture member, an electrode, and a display especially about the hemanalysis equipment which can analyze the detected matter contained in blood, such as the blood sugar level.

[0002]

[Description of the Prior Art] Conventionally, when the blood sugar level etc. was measured, it was carrying out by making the blood drop adhere to the electrode with which attached the blemish to the fingertip using the reusable puncture instrument (Lancet), pressed out the blood drop from there, picked out from the wrapping material, and the sensor was equipped. However, when the reusable puncture instrument and the sensor have dissociated in this way, there are many processes which are required in performing a series of actuation.

[0003] Then, the blood collecting machine (refer to JP,5-95937,A and JP,5-95938,A) with which the blood collecting machine (refer to JP,5-111476,A, JP,6-311980,A, JP,6-327655,A, and JP,7-51251,A) with which the medical-application system (refer to JP,61-286738,A) by which the reusable puncture needle, the capillary tube, and the sensor were united, a reusable puncture needle, a suction implement, and \*\*\*\*\* were united and a reusable puncture needle, a suction implement, \*\*\*\*\*, and a sensor were united was proposed.

[0004] However, the blood collecting approach in these instruments It is what is depended on the method with which all are decompressed by the syringe, a syringe, etc. and attract blood. unless it sticks the base of a cylinder on the skin, it cannot decompress, but when the cylinder below phi1.5 mm is used, blood plugs up a hole with the former, there is a fault of bleeding stopping, and the structure of a syringe is complicated in the latter - etc. - there was a fault.

[0005]

[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the convenient hemanalysis equipment which has the device it collecting blood by the approach by suction, and possesses a puncture member, an electrode, and a display.

[0006]

[Means for Solving the Problem] By adopting the blood collecting device in which this invention person etc. has the means which extrudes blood from the skin in view of the above-mentioned technical problem as a result of wholeheartedly research, even if not based on the suction approach, it could collect blood easily, and a header and this invention were completed for the ability of blood to be analyzed that it is simple and quickly.

[0007] That is, this invention possesses a blood collecting device, a puncture member, an electrode, and a display, and is hemanalysis equipment with which said blood collecting device is characterized by having the means which extrudes blood from the skin. Moreover, this invention is the above-mentioned



hemanalysis equipment characterized by the puncture member and the electrode being a cartridge-type. [0008] Furthermore, this invention is the above-mentioned hemanalysis equipment characterized by installing said electrode in the location in contact with the blood extruded from the skin in the condition that the body was equipped with hemanalysis equipment. The base of a cartridge has tabular, the puncture member is prepared in one side possible [ sliding ], and this invention is the above-mentioned hemanalysis equipment characterized by arranging the electrode in an another side side further again.

[0009]

[Function] With the hemanalysis equipment of this invention which has the device in which it collects blood with a knockout means, and possesses a puncture member, an electrode, and a display The problem that it cannot decompress unless it sticks the base of the problem accompanying the approach of collecting blood by suction, i.e., a cylinder, on the skin, When the cylinder below phi1.5 mm is used, blood plugs up a hole. The problem that bleeding will stop, the problem that the structure of a syringe is complicated, etc. are solvable, and a general user cannot need skill, but can collect blood easily and quickly, and can analyze the detected matter.

[0010] Moreover, if the puncture member and electrode in hemanalysis equipment of this invention are made into a cartridge-type, since they can be made throwing away in one, bacterial infection etc. can be prevented. Furthermore, since the blood which bled installing the electrode in the hemanalysis equipment of this invention in the location in contact with the blood extruded from the skin and by arranging a puncture member in the background of a base prepared possible [ sliding ] contacts an enzyme and an electrode immediately, it is not necessary not to establish a means to contact especially blood to an electrode etc., a series of actuation processes which analysis takes can reduce, and inspection can substitute for one-touch.

[0011]

[Example] Hereafter, this invention is explained to a detail with reference to a drawing. The perspective view of hemanalysis equipment with an example of this invention is shown in drawing 1. This hemanalysis equipment 1 has housing 2, the display 3, the main switch 4 and the reusable puncture needle discharge switch 5 which were formed in the field of 1 of that housing 2, and the puncture section 7 which extruded and was prepared between two rollers which were formed in other fields of housing 2, and which the roller section 6 and the extrusion roller section 6 have.

[0012] Drawing 2 is drawing having shown the extrusion roller section 6 in the detail. The extrusion roller section 6 has the roller 61 driven by the motor 63, and the roller 62 which can be rotated. The shaft 64 of a roller 61 has become crank-like, and a roller 61 is offset and installed. In order to extrude blood from the skin with these two rollers 61 and 62, as for rollers 61 and 62, it is desirable to produce from the ingredient with large coefficient of friction to the skin.

[0013] As shown in drawing 3, the reusable puncture needle 71 is installed in the puncture section 7, and this reusable puncture needle 71 slides on the inside of the blood collecting member 9 of the shape of an rectangular pipe held in the sleeve 8. This reusable puncture needle 71, the blood collecting member 9, and a sleeve 8 constitute the dismountable cartridge 10 from housing 2. Therefore, it will become very advantageous for reasons of sanitation by making this cartridge 10 throwing away.

[0014] A reusable puncture needle 71 is hammered out with the hammer 72 connected with the spring 73, and projects from the puncture section 7. What is necessary is just to establish a means which operates that what is necessary is just to perform actuation of a hammer 72 with a conventional method when the reusable puncture needle discharge switch 5 is pushed. In addition, as shown in drawing 4, the spring 74 for returning root Motobe of a reusable puncture needle 71 the hammered-out reusable puncture needle 71 is installed.

[0015] Two electrodes 92 and 93 are formed in the wall 91 which constitutes the rectangular pipe of the blood collecting member 9, and enzyme ink 94 is applied to one electrode 93 (refer to drawing 5). These electrodes 92 and 93 are connected to a sensor (not shown) through a sleeve 8. When various things can be chosen according to the detected matter in blood, for example, it measures the blood sugar level, the

ink constituent containing glucose oxidase etc. can be used for enzyme ink 94.

[0016] The blood collecting member 9 is installed in the location where the blood drop extruded from the skin with rollers 61 and 62 contacts, and the centrum 95 of the blood collecting member 9 is set as size in which a blood drop is absorbed by capillarity. The blood collecting member 9 is produced with the ingredient which performs hydrophilic processing to the interior of the blood collecting member 9, or has a hydrophilic property preferably. How to measure the detected matter in blood is explained using the above-mentioned hemanalysis equipment. Here, although the case where it collects blood from a fingertip is mentioned as an example and explained, this invention is not limited to this.

[0017] First, a main switch 4 is turned on and the part of the antinode of a fingertip is pressed against rollers 61 and 62. In this condition, the reusable puncture needle discharge switch 5 is turned on. If the reusable puncture needle discharge switch 5 is turned on, the hammer 72 energized with the spring 73 will hammer out a reusable puncture needle 71. After it projects the hammered-out reusable puncture needle 71 from the puncture section 7 among rollers 61 and 62 and it damages the skin of a fingertip, it returns to the original location according to an operation of a spring 74. A motor 63 drives with it and a shaft 64 and a roller 61 rotate. Since the roller 61 is offset, spacing with a roller 62 becomes narrow by rotating. Therefore, rollers 61 and 62 will put the skin and will extrude blood from the skin which got damaged as shown in drawing 6.

[0018] The extruded blood drop contacts the blood collecting member 9, and is absorbed by the centrum 95 of the blood collecting member 9 by capillarity. The sucked-in blood contacts enzyme ink 94 and electrodes 92 and 93, and the detected matter in blood serves as an electrical signal, it is sent to a sensor, and measured value is shown in a display 3. According to the hemanalysis equipment of such this invention, a series of actuation processes can be reduced and inspection can be substituted for one-touch. Moreover, since this equipment possesses all of a blood collecting device, a puncture member, an electrode, and a display, a general user does not need skill but can use it easily and quickly. Furthermore, with the hemanalysis equipment of this invention, not only the blood sugar level but the various matter in blood can be analyzed by changing the class of enzyme ink to be used.

[0019] As mentioned above, although this invention was explained to the detail using the drawing, this invention can perform various modification, unless it deviates from the thought of this invention, without being limited to this. For example, another example from which the drive of a blood collecting device, a puncture member, an electrode, and a puncture member differs is shown in drawing 7 and drawing 8. tabular base 101 with which the cartridge 10 was held into the sleeve 8 and the sleeve 8 as shown in drawing 7 from -- it is constituted. Base 101 In one side, it is the puncture cutting edge 102. It is prepared possible [ sliding ] (refer to drawing 8 (a) and (b)), and electrode 103a and electrode lead 103b are arranged in the another side side (refer to drawing 8 R> 8 (c)). base 101 Height 104 having -- electrode lead 103b -- this height 104 up to -- it extends and electrode 103a is formed. In addition, base 101 And puncture cutting edge 102 It is drawing 8 (d) about the perspective view seen from back. It is shown.

[0020] this example -- puncture cutting edge 102 Arm member 106 minding -- electromagnet 107 it drives -- having -- base 101 Height 104 from -- it projects. Electromagnet 107 By turning on and off of a power source, it drives by the interaction with the magnet (not shown) installed into housing. base 101 \*\*\*\* -- flat spring 105 it installs -- having -- \*\*\*\* -- arm member 106 Puncture cutting edge 102 projected and carried out It is made to retreat. Puncture cutting edge 102 projected in this cartridge 10 The blood drop which damaged the skin and was extruded with the roller etc. is a height 104. Electrode 103a and enzyme ink (not shown) which were prepared are contacted, and it is changed into an electrical signal.

[0021] moreover, the blood collecting device in the hemanalysis equipment of this invention is restricted to what is depended on two rollers -- not having -- for example, the knife of two sheets -- by the member of a \*\*, as the skin is put, blood may be extruded, the member of the shape of two ring may be fastened around a finger, and blood may be extruded by narrowing spacing of the two rings.

[0022]

[Effect of the Invention] According to this invention, it can collect blood easily by the approach by suction, and blood can be analyzed that it is simple and quickly.

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**OPERATION**

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EXAMPLE

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[0013] As shown in drawing 3, the reusable puncture needle 71 is installed in the puncture section 7, and this reusable puncture needle 71 slides on the inside of the blood collecting member 9 of the shape of an rectangular pipe held in the sleeve 8. This reusable puncture needle 71, the blood collecting member 9, and a sleeve 8 constitute the dismountable cartridge 10 from housing 2. Therefore, it will become very advantageous for reasons of sanitation by making this cartridge 10 throwing away.

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[0020] this example – puncture cutting edge 102 Arm member 106 minding – electromagnet 107 it drives – having – base 101 Height 104 from – it projects. Electromagnet 107 By turning on and off of a power source, it drives by the interaction with the magnet (not shown) installed into housing. base 101 \*\*\*\* – flat spring 105 it installs – having – \*\*\*\* – arm member 106 Puncture cutting edge 102 projected and carried out It is made to retreat. Puncture cutting edge 102 projected in this cartridge 10 The blood drop which damaged the skin and was extruded with the roller etc. is a height 104. Electrode 103a and enzyme ink (not shown) which were prepared are contacted, and it is changed into an electrical signal.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing an example of the hemanalysis equipment of this invention.

[Drawing 2] It is drawing having shown the blood collecting device in the hemanalysis equipment of this invention in the detail.

[Drawing 3] It is drawing showing an example of the drive of the cartridge in the hemanalysis equipment of this invention, and a puncture member.

[Drawing 4] It is drawing showing the blood collecting member and reusable puncture needle in hemanalysis equipment of this invention.

[Drawing 5] It is drawing showing the condition that the blood collecting member in the hemanalysis equipment of this invention decomposed.

[Drawing 6] It is drawing showing the condition of extruding blood from the skin, with the roller in the hemanalysis equipment of this invention.

[Drawing 7] It is drawing showing other examples of the drive of the cartridge in the hemanalysis equipment of this invention, and a puncture member.

[Drawing 8] It is drawing showing the base and reusable puncture needle of a cartridge in the hemanalysis equipment of this invention. (a) It is drawing seen from the \*\*\*\*\* side, and is (b). It is drawing showing the condition that the puncture cutting edge projected, and is (c). It is drawing seen from the electrode side, and is (d). It is drawing seen from back.

[Description of Notations]

- 1 – Hemanalysis equipment 2 – Housing
- 3 – Display 4 – Main switch
- 5 – Reusable puncture needle discharge switch 6 – Extrusion roller section
- 61 62 – Roller 63 – Motor
- 64 – Shaft 7 – Puncture section
- 71 – Reusable puncture needle 72 – Hammer
- 73 74 – Spring 8 – Sleeve
- 9 – Blood collecting member 91 – Wall
- 92 93 – Electrode 94 – Enzyme ink
- 95 – Centrum 10 – Cartridge
- 101 – Base 102 – Puncture Cutting Edge
- 103a – Electrode 103b – Electrode lead
- 104 – Height 105 – Flat Spring
- 106 – Arm Member 107 – Electromagnet

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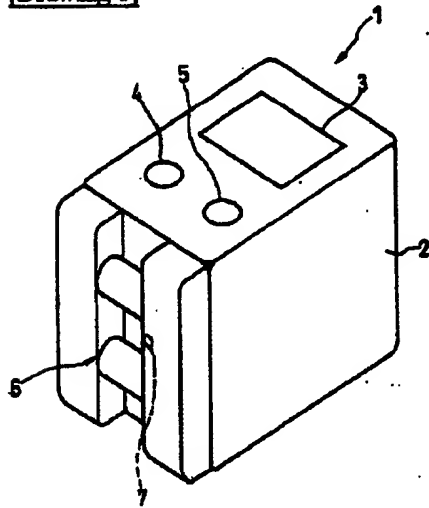
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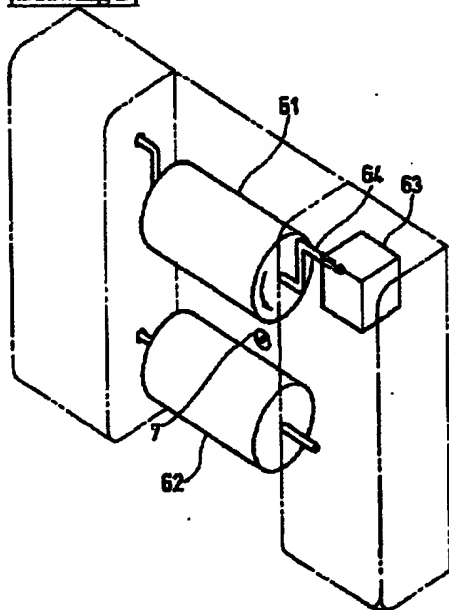
**DRAWINGS**

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[Drawing 1]

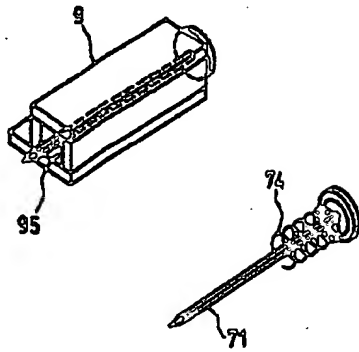


[Drawing 2]

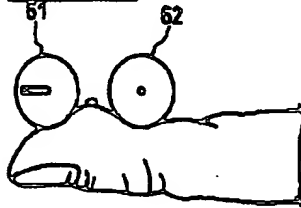


[Drawing 4]

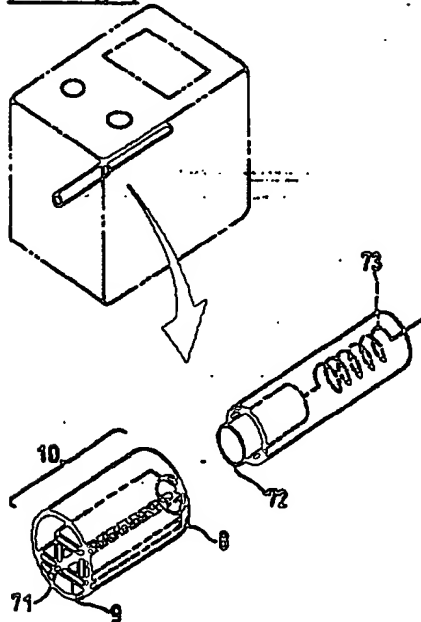




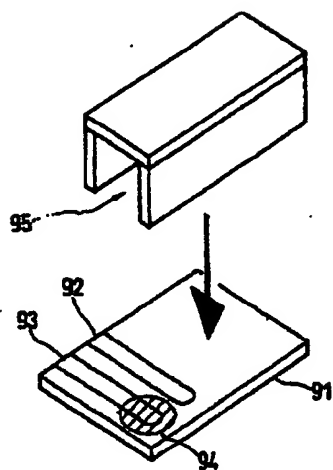
[Drawing 6]



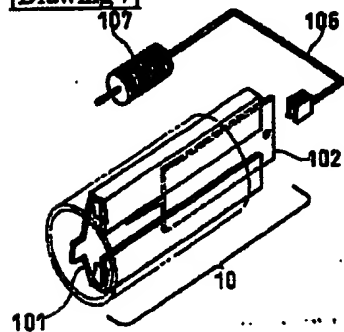
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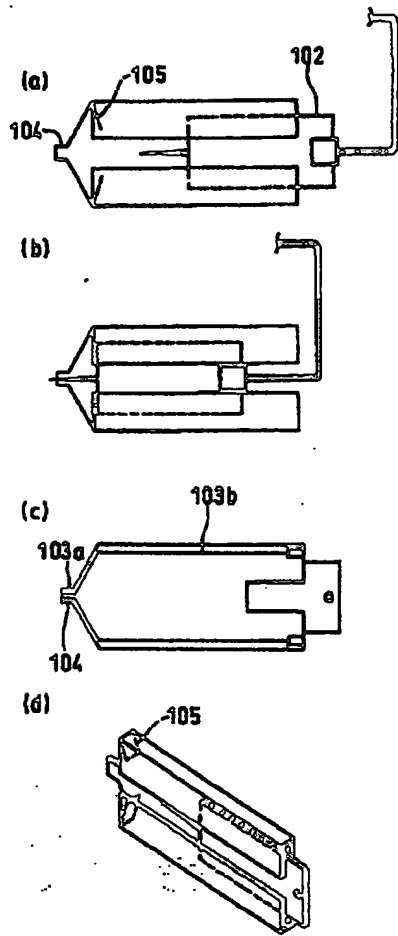
[Drawing 5]



[Drawing 7]



[Drawing 8]



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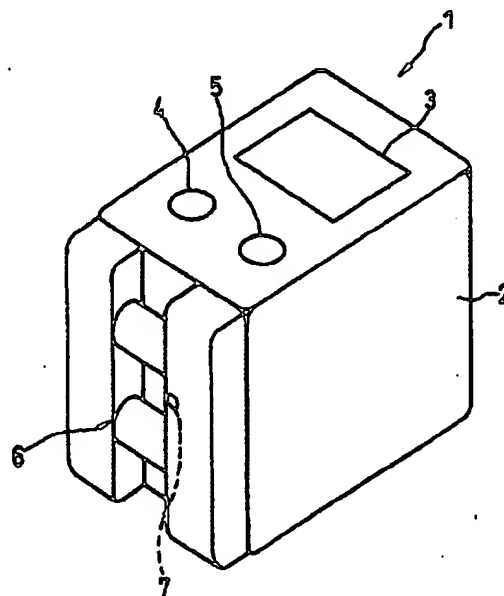
最良図に徴く

(54) 発明の名称 血液分析装置

(57) 【要約】

【解決手段】 採血針、穿刺部材、電圧及び表示部を具備し、前記採血針が、皮膚から血液を押し出す手段を有することを特徴とする血液分析装置。

【効果】 吸引によらない方法で容易に採血でき、血液の分析を簡便にかつ迅速に行うことができる。



## 【特許請求の範囲】

【請求項1】 採血機構、穿刺部材、電極及び表示部を具備し、前記採血機構が、皮膚から血液を押し出す手段を有することを特徴とする血液分析装置。

【請求項2】 前記穿刺部材及び電極がカートリッジ式になっていることを特徴とする、請求項1記載の血液分析装置。

【請求項3】 血液分析装置が人体に装着された状態において、皮膚から押し出された血液に接触する位置に前記電極が設置されていることを特徴とする、請求項1又は2記載の血液分析装置。

【請求項4】 カートリッジの基体が板状になっており、一方の側に穿刺部材が摺動可能に設けられており、他方の側に電極が配設されていることを特徴とする、請求項2又は3記載の血液分析装置。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は血糖値等、血液中に含まれる被検知物質を分析することのできる血液分析装置に関し、特に採血機構、穿刺部材、電極及び表示部をすべて具備した血液分析装置に関する。

【0002】

【従来の技術】従来より、血糖値等を測定する場合には、穿刺器具（ランセット）を用いて指先に傷を付け、そこから血液を絞り出し、包材より取り出してセンサーに装着した電極にその血液を付着させることにより行っていた。しかしながら、このように穿刺器具とセンサーが分離していると、一連の操作を行うにあたって要する過程が多い。

【0003】そこで、穿刺針、毛細管及びセンサーが一体になった医療用システム（特開昭61-286738号公報参照）、穿刺針、吸引具及び血溜体が一体になった採血器（特開平5-111476号公報、特開平6-311980号公報、特開平6-327655号公報、特開平7-51251号公報参照）ならびに穿刺針、吸引具、血溜体及びセンサーが一体になった採血器（特開平5-95937号公報、特開平5-95938号公報参照）が提案された。

【0004】しかしながら、これらの器具における採血方法は、いずれも注射器やスポイト等により減圧して血液を吸引する方式によるものであり、前者ではシリンダーの底面を皮膚に密着させないと減圧することができず、 $\phi 1.5$  mm以下のシリンダーを使用した場合には血液が穴を塞いでしまい、出血が停止してしまう等の欠点があり、後者ではスポイトの構造が複雑である等の欠点があった。

【0005】

【発明が解決しようとする課題】本発明の課題は、吸引によらない方法で採血する機構を有し、穿刺部材、電極及び表示部を具備した便利な血液分析装置を提供することである。

【0006】

【課題を解決する手段】上記課題に鑑み鋭意研究の結果、本発明者等は、皮膚から血液を押し出す手段を有する採血機構を採用することにより、吸引方法によらずとも容易に採血することができ、血液の分析を簡便かつ迅速に行うことができることを見出し、本発明を完成した。

【0007】即ち、本発明は、採血機構、穿刺部材、電極及び表示部を具備し、前記採血機構が、皮膚から血液を押し出す手段を有することを特徴とする血液分析装置である。また、本発明は、穿刺部材及び電極がカートリッジ式になっていることを特徴とする上記血液分析装置である。

【0008】さらに、本発明は、血液分析装置が人体に装着された状態において、皮膚から押し出された血液に接触する位置に前記電極が設置されていることを特徴とする上記血液分析装置である。さらにまた、本発明は、カートリッジの基体が板状になっており、一方の側に穿刺部材が摺動可能に設けられており、他方の側に電極が配設されていることを特徴とする上記血液分析装置である。

【0009】

【作用】押し出し手段で採血する機構を有し、穿刺部材、電極及び表示部を具備した本発明の血液分析装置では、吸引により採血する方法に伴う問題、即ちシリンダーの底面を皮膚に密着させないと減圧することができないという問題、 $\phi 1.5$  mm以下のシリンダーを使用した場合に血液が穴を塞いでしまい、出血が停止してしまうという問題、スポイトの構造が複雑であるという問題等を解決することができ、一般ユーザーが熟練を必要とせず、容易かつ迅速に採血し、被検知物質を分析することができる。

【0010】また、本発明の血液分析装置における穿刺部材及び電極をカートリッジ式にすれば、それらを一体的に使い捨てにすることができるため、細菌の感染等を防止することができる。さらに、本発明の血液分析装置における電極を、皮膚から押し出された血液に接触する位置に設置すること、穿刺部材が摺動可能に設けられた基体の裏側に配設することにより、出血した血液がすぐさま酵素及び電極に接触するため、特に血液を電極等に接触させる手段を設ける必要がなく、分析に要する一連の操作過程を減らし、ワンタッチで検査を済ませることができる。

【0011】

【実施例】以下、図面を参照して本発明を詳細に説明する。本発明の一例による血液分析装置の斜視図を図1に示す。この血液分析装置1は、ハウジング2と、そのハウジング2の一の面に設けられた表示部3、メインスイッチ4及び穿刺針発射スイッチ5と、ハウジング2の他の面に設けられた押し出しローラー部6と、押し出しローラ

一部6が有する2つのローラーの間に掛けられた穿刺部7とを有する。

【0012】図2は、押し出しローラー部6を詳細に示した図である。押し出しローラー部6は、モーター63によって駆動されるローラー61と、回転自在なローラー62とを有する。ローラー61の端部はクランク状になっており、ローラー61はオフセットされて設置される。この2つのローラー61、62によって皮膚から血液を押し出すため、ローラー61、62は皮膚に対する摩擦係数の大きい材料から作製するのが好ましい。

【0013】図3に示すように、穿刺部7には穿刺針71が設置されており、この穿刺針71はスリーブ8に収容された角筒状の採血部材9の中を移動する。この穿刺針71、採血部材9及びスリーブ8は、ハウジング2から取り外し可能なカートリッジ10を構成する。従って、このカートリッジ10を使い捨てにすることにより、衛生上非常に有利なものとなる。

【0014】穿刺針71は、バネ73に連結したハンマー72によって打ち出され、穿刺部7から突出する。ハンマー72の作動は常法によって行えばよく、穿刺針昇降スイッチ5を押した時に作動するような手段を取ればよい。なお、図4に示すように、穿刺針71の根元部には、打ち出された穿刺針71を戻すためのバネ74が設置されている。

【0015】採血部材9の角筒を構成する蓋部91には2つの電極92、93が設けられており、一方の電極93には図5に示すインキ94が塗布されている（図5参照）。この電極92、93は、スリーブ8を介してセンサー（図示せず）に接続される。図5に示すインキ94は、血液中の糖質や脂質に反応して電圧の異なるものを検出することができ、例えば血糖値を測定する場合には、グルコースオキシダーゼ等を含むインキ組成物を用いることができる。

【0016】採血部材9は、ローラー61、62によって皮膚から押し出された血液が接触する位置に設置され、採血部材9の中空部95は、血液が毛細管現象により吸い込まれるようなサイズに設定される。好ましくは、採血部材9の内部に排水通路を設け、排水径を有する材料により採血部材9を作製する。上記血液分析装置を用いて、血液中の糖質や脂質を測定する方法を説明する。ここでは、指先から採血する場合を例に挙げて説明するが、本発明はこれに限定されない。

【0017】まず最初に、メインスイッチ4を入れ、ローラー61、62に指先の皮肉部分を押し当てる。この状態で、穿刺針昇降スイッチ5を入れる。穿刺針昇降スイッチ5が入ると、バネ73で付勢されたハンマー72が穿刺針71を打ち出す。打ち出された穿刺針71は、ローラー61及び62の間に穿刺部7から突出して指先の皮肉を傷付けた後、バネ74の作用により元の位置に戻る。それとともにモーター63が駆動し、ローラー61及び62が回転する。ローラー61はオフセットされているため、回転する

ことによりローラー62との間隔が狭くなる。従って、ローラー61、62は皮肉を挟み込み、図6に示すように傷ついた皮膚から血液を押し出すこととなる。

【0018】押し出された血液は採血部材9に接触し、毛細管現象により採血部材9の中空部95に吸い込まれる。吸い込まれた血液は、図5に示すインキ94及び電極92、93に接触し、血中の糖質や脂質が電気信号となってセンサーに送られ、測定値が表示部3に示される。このような本発明の血液分析装置によれば、一連の動作過程を流し、ワンタッチでも操作を済ませることができる。また、本装置は採血部材、穿刺部材、電極及び表示部を全て具備しているため、一般ユーザーが換装を必要とせず、容易かつ迅速に使用することができる。さらに、本発明の血液分析装置では、使用する図5に示すインキの種類を変えることにより、血糖値のみならず、電圧の血中物質の分析を行うことができる。

【0019】以上、図面を用いて本発明を詳細に説明したが、本発明はこれに限定されることなく、本発明の思想を逸脱しない限り、種々の変更を施すことができる。例えば、採血部材、穿刺部材、電極及び穿刺部材の駆動機構が異なる別の実施例を図7及び図8に示す。図7に示すように、カートリッジ10は、スリーブ8と、スリーブ8の中に収容された板状の基体101とから構成されている。基体101の一方の側には、穿刺針102が移動可能に設けられており（図8(a)及び(b)参照）、他方の側には電極103a及び電極リード103bが設置されている（図8(c)参照）。基体101は突起部104を有し、電極リード103bがこの突起部104まで延在し、電極103aを形成する。なお、基体101及び穿刺針102を後方から見た側視図を図8(d)に示す。

【0020】本実施例では、穿刺針102はアーム部材106を介して図8に示す導石107によって駆動され、基体101の突起部104から突出する。導石107は、電極のオン・オフによって、ハウジング中に設置された導石（図示せず）との相互作用で駆動される。基体101には板バネ105が設置されており、アーム部材106によって突出された穿刺針102を後退させる。本カートリッジ10では、突出した穿刺針102が皮膚を傷つけ、ローラーによって押し出された血液が突起部104に設けられた電極103a及び図5に示すインキ（図示せず）に接触し、電気信号に変換される。

【0021】また、本発明の血液分析装置における採血機構は、2つのローラーによるものに限られず、例えば、2枚のへら状の部材によって皮膚を挟み込むようにして血液を押し出すものであってもよいし、2つのリング状の部材を指に環装し、その2つのリングの間隔を狭めることによって血液を押し出すものであってもよい。

【0022】

【発明の効果】本発明によれば、吸引によらない方法で容易に採血でき、血液の分析を簡便にかつ迅速に行うこ

とができる。

【図面の簡単な説明】

【図1】本発明の血液分析装置の一例を示す斜視図である。

【図2】本発明の血液分析装置における採血機構を詳細に示した図である。

【図3】本発明の血液分析装置におけるカートリッジ及び穿刺部材の駆動機構の一例を示す図である。

【図4】本発明の血液分析装置における採血部材及び穿刺針を示す図である。

【図5】本発明の血液分析装置における採血部材の分解した状態を示す図である。

【図6】本発明の血液分析装置におけるローラーにより、皮膚から血液を押し出す状態を示す図である。

【図7】本発明の血液分析装置におけるカートリッジ及び穿刺部材の駆動機構の他の例を示す図である。

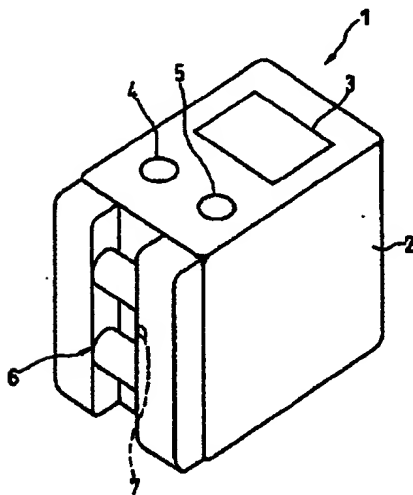
【図8】本発明の血液分析装置におけるカートリッジの基体及び穿刺針を示す図である。(a)は穿刺刃側から見

た図であり、(b)は穿刺刃が突出した状態を示す図であり、(c)は電極側から見た図であり、(d)は後方から見た図である。

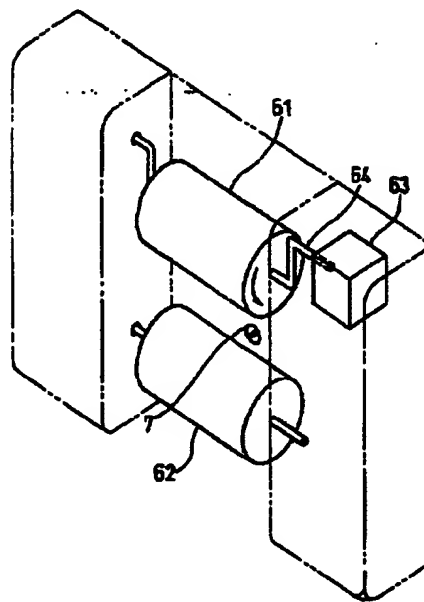
【符号の説明】

- |             |             |
|-------------|-------------|
| 1…血液分析装置    | 2…ハウジング     |
| 3…表示部       | 4…メインスイッチ   |
| 5…穿刺針発射スイッチ | 6…押し出しローラー部 |
| 61, 62…ローラー | 63…モーター     |
| 64…軸        | 7…穿刺部       |
| 71…穿刺針      | 72…ハンマー     |
| 73, 74…バネ   | 8…スリーブ      |
| 9…採血部材      | 91…壁部       |
| 92, 93…電極   | 94…酵素インキ    |
| 95…中空部      | 10…カートリッジ   |
| 101…基体      | 102…穿刺刃     |
| 103a…電極     | 103b…電極リード  |
| 104…突起部     | 105…板バネ     |
| 106…アーム部材   | 107…電磁石     |

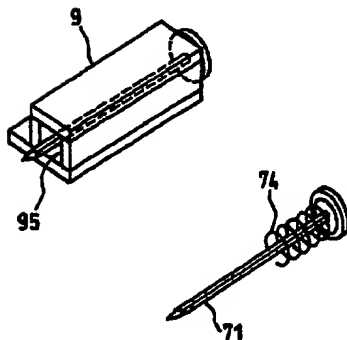
【図1】



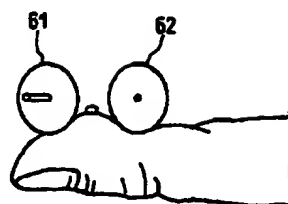
【図2】



【図4】

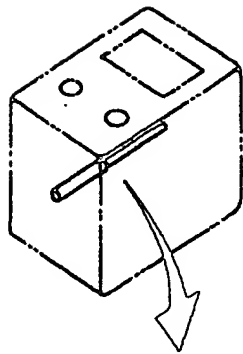


【図6】

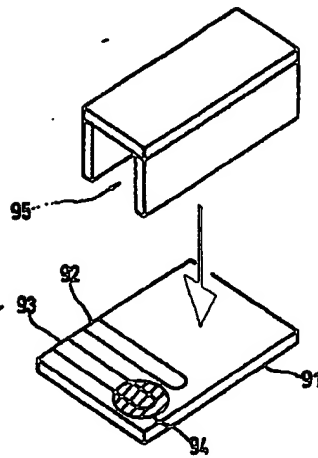




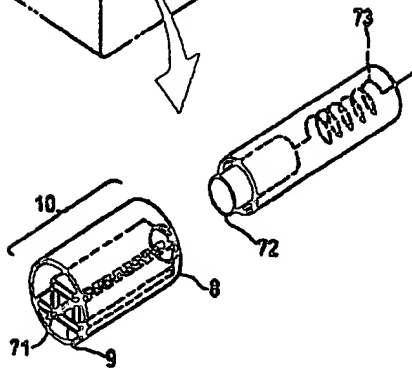
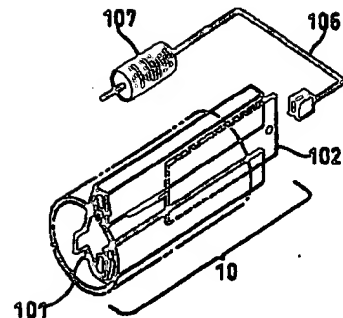
【図3】



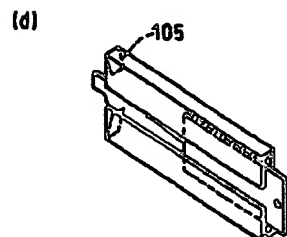
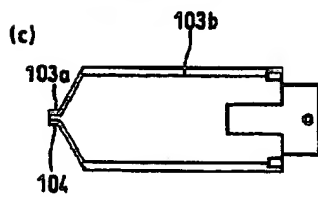
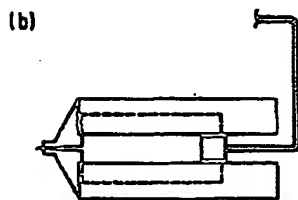
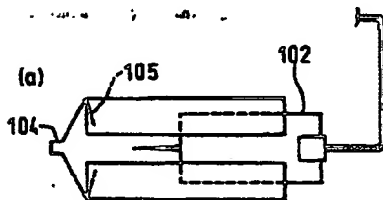
【図5】



【図7】



【図8】



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